

# Measuring Spatial Intelligence and Memory for Location in Athletes

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## Background

- Seven tasks have been used to assess memory for location and spatial abilities. The tasks measure average short term memory, accuracy in spatial location recall, the ability to mentally perform tasks, the ability to visualize different perspectives, navigational abilities, mental rotation of objects and handedness.
- There should be no difference in short term memory for athletes and non-athletes. However, because of athletes' years of experience with pattern recognition and spatial tracking, we expect to see a difference in spatial abilities and location recall (Abernathy, Baker & Cote, 2005). The results should show differences in these two areas only, as these are the skills athletes perfect on a regular basis.
- Reio, Czarnolewski & Eliot (2004) found left-handedness to be correlated with faster and more accurate 3D rotation/visualization. However, location for spatial memory was faster and more accurate in participants who were right-handed. Therefore, the best performance on memory for location should be seen in athletes who are right-handed.
- Increasing the number of distracters in a location memory task slows recall for target information (Sternberg, 1966). Landmarks facilitate memory for location by functioning as a spatial prototype for a region (Plumert & Hund, 2001).
- Lloyd & Bunch (2010) found that spatial learning and spatial working memory were positively correlated with experience. Similarly, Brockmole, Hambrick, Windisch & Henderson (2008) found that expert chess players performed better than non-experts in determining the position of a search target. They suggest that this difference is due to semantic meaning, when the experts relate the spatial task to a familiar context (chess). We anticipate that athletes in our experiment will form a context for the spatial task and results will be similar to those demonstrated in Brockmole et al. (2008).

## Hypotheses

### Memory for Location Task

- Distracters will hinder the ability to recall the location of a target for both athletes and non-athletes.
- Including a landmark (such as a black oval) will aid in the recall of the location of the target.

### Memory Span Task

- Athletes and non-athlete participants will have similar scores on a short-term memory span task because this memory skill is not part of an athlete's specialized memory skill set.

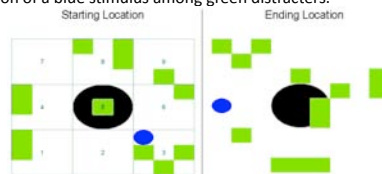
## Method

**Participants:** 30 undergraduates who identified as non-intercollegiate athletes (Testing is still in progress.)

### Tasks

**Memory Span Task (RSVP)** – A series of 6-12 phonetically distinguishable consonants are presented in a random order (e.g. X, Q, R, P, S, T). The series are separated by a mask, after which participants are instructed to recall as many of the letters possible with out regard to presentation order

**Memory for Location (M4L)** – A test of spatial memory in which participants are shown a series of slides in quick secession and prompted for the beginning or ending location of a blue stimulus among green distracters.

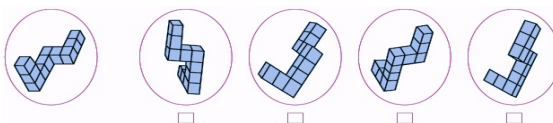


**Spatial Orientation (SO)** –Participants are given an array of objects, such as below. They are to imagine they are standing at one object (center) and facing a second object. The task is to draw an arrow from the center object to a third object. This will allow us to determine the accuracy of the participants in determining their relationship with other objects in the environment.



Imagine you are standing at the flower and facing the tree. Point to the cat.

**Mental Rotation (MR)** –Participants decide which two of four pictures have the same spatial configuration as the one shown on the left. This task is used to test the accuracy in perceiving the spatial layout of an object.



**Santa Barbara Sense of Direction (SBSOD)** – This survey assess directional and navigational abilities, providing information on how well participants navigate in their environments.

**Movement Imagery Questionnaire- Revised (MIQ-R)** – Participants perform a particular body movement, such as jumping, and then must either visualize the movement or attempt to feel oneself performing the movement. The MIQ-R assesses the ability to use kinesthetic and visual imagery.

**Handedness**- This survey identifies a dominant hand that is used the most in common activities. Previous research has suggested that there is a correlation between handedness and spatial abilities.

### Procedure:

Both athletes and non-athletes complete all 7 measures. These 7 tasks previously described are presented to participants in a counter-balanced and random order. M4L, RSVP, Handedness and SBSOD are completed on a desktop computer. The MIQ-R, SO, and MR tasks are administered on paper. The total time to complete all tasks is between 60 and 90 minutes.

## Expectations

- In the Memory for Location task we expect that when participants are shown a landmark their ability to remember the location of the blue stimulus will increase.
- The landmark will be of more use when the number of distracters is increased. This will allow the participants to have a point of reference when determining the location of the blue stimulus.

## Implications of Present Research

- If we see our predicted results we expect to see a strong positive relationship between spatial ability and expertise, such as seen in athletic ability and experience.
- In our opinion we believe that inter-collegiate athletes will have a better, more developed memory of location. They should perform better on the spatial tasks than non athletes.
- No difference in memory span tasks suggests that athletes have the same sort of everyday memory as everyone else.
- If this study tested other specialized populations, such as professional dancers, results might demonstrate the same degree of expertise in memory for location and high spatial abilities as athletes.

## References

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